

REMARKS/ARGUMENTS

Claims 26-37, 40-42, 44-45, 47-48, 60-64, and 66-67 are pending with entry of this amendment. Claims 1-25, 38-39, 43, 46 and 49-59 were previously canceled without prejudice. Claims 65, 68, and 69 are canceled herein. Claims 26, 44, 64, 66, and 67 are amended herein. These amendments introduce no new matter and support for the amendments is replete throughout the specification and claims as originally filed. These amendments are made without prejudice and are not to be construed as abandonment of the previously claimed subject matter, or agreement with any objection or rejection of record.

The amendments to claim 26 finds support in the specification, e.g., at original claim 65. Support for the amendment to claim 67 is found at, e.g., Figures 3A-3B, and ¶ 56-58 and 76.

I. Priority

Examiner alleged that claim 69 does not find support in the priority document, provisional application 60/463,765. In order to expedite the application to allowance, claim 69 is canceled herein.

II. Rejections Under 35 U.S.C. §112

Claims 26-37, 40-42, 44-45, 47-48, 60-66, and 69 were rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description and enablement requirements, and under 35 U.S.C. §112, second paragraph, as allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants respectfully disagree with this rejection.

With respect to the limitations related to the interaction between two or more different subsets of nanocrystals, Examiner argued that “[t]he instant specification is in fact silent with regard to interaction BETWEEN nanocrystals. Consequently, while the instant specification provides support for distinct mixtures of nanocrystal particles such that the relative abundances of the subsets of nanocrystals are linearly reflected, as shown in the instant Figures, the instant specification does not provide support for interactions

(i.e. cooperativity or any other type of interaction) between the distinct subsets of nanocrystals.” (OA, pg. 5)

While Examiner argues that Applicants’ specification is “silent with regard to interaction BETWEEN nanocrystals,” Applicants would like to clarify that the limitation of independent claim 1 refers to an interaction between **optical properties** of the nanocrystal subsets, rather than an interaction between the nanocrystals themselves as inferred by Examiner. As would be clearly understood by a person of ordinary skill in the art, an optical property is not a nanocrystal, but rather a property of a nanocrystal. As explained in Applicants’ specification, optical properties of a subset of nanocrystals can include, e.g., excitation/emission wavelength, polarity angle, spectral width, intensity, and frequency; and spectral emission shapes or patterns. (See Applicants’ specification, e.g., at ¶ 10, 14, 42, 45, 79, and 102) Applicants respectfully submit that the rejection under §112, first paragraph, is improper since it is based on claim language inferred by the Examiner which is not included in the claims.

To the extent that the rejection under §112, first paragraph, is applied to the actual claim language of independent claims 1 and 67, Applicants submit that the instant specification provides full support for the language according to the requirements of 35 U.S.C. §112. While the exact claim language may not be cited in the specification, the current examination guidelines do not require such support. As explained in MPEP 2163(I)(B), the exact wording of a claim amendment need not be included in the specification as filed to comply with the written description requirement of §112—“While there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure.” Thus, while the exact claim language of the rejected claims may not have been present in the specification at the time of filing, Applicants respectfully submit that the specification includes a description of the subject matter which reasonably conveys to one skilled in the relevant art that the inventors had possession of the claimed invention at the time the application was filed. “An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed

invention.” *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997). As described in the instant specification, the invention envisioned by Applicants includes a spectral code which incorporates the interaction of optical properties of different nanocrystal subsets, as set forth in independent claim 1. For example, as described in paragraphs 38 and 76 and shown in figure 3, the unique spectral code of the invention can include an optical property such as the combination of emission intensities of different nanocrystal subsets having different excitation wavelengths. As another example, the specification describes that an optical property of a unique spectral code of the invention can include the combined emission frequencies from different nanocrystal subsets. (¶ 14, 60, and 102) As yet another example, an optical property of the spectral code can include overall excitation/emission peak shapes or patterns (i.e., the interaction of different emission spectra shapes to create one unique spectral shape of the combined emission shapes). (¶106) Thus, the specification as filed fully supports the limitation of a unique spectral code with an optical property including the interaction between optical properties of different nanocrystal subsets.

Examiner argued that “the closest support in the disclosure is taught in paragraph 60, wherein ‘multiplexed’ data can be used in analyzing, encoding, and decoding the resultant data.” However, as explained above, Applicants’ specification fully supports the limitation at issue. In supporting the rejection, Examiner incorrectly relied on Applicants’ own remarks in the previous Response used to **distinguish** the prior art and the present invention of claim 1, stating: “applicant effectively reiterates the teaching in Han et al. that while the optical coding taught may be multiplexed, there is no requirement for interactions (i.e. FRET) between the subsets of distinct nanocrystals in the mixture. In fact, Han et al. states that there CANNOT be interactions between the different subsets of nanocrystals (see enablement rejection below) in order for the multiplexed coding to be properly detected and analyzed.” (OA, pg. 6, citing Han et al. (Nature Biotechnology, July 2001, volume 19, pages 631-635) (hereinafter “Han”)) Applicants would like to clarify that the argument regarding Han in the previous Response was relevant to the teachings of Han, **not** to the teachings of Applicants’ own invention. Examiner’s argument regarding Han is essentially based on the fact that both

Han and Applicants' specification include the word "multiplex" to describe arrays of optical data; this argument is unreasonable since the excerpts are taken out of context to categorize the teachings of Han and Applicants' specification as the same. A person of ordinary skill in the art would recognize the differences between Han and Applicants' invention. Further, Applicants maintain the following positions: (1) Han teaches away from the invention of the present claims. (2) Applicants' invention is non-obvious in light of Han since the invention proceeds contrary to the teachings of Han, and "proceeding contrary to accepted wisdom is evidence of nonobviousness." *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986). (3) The invention is not obvious in light of Han since Han teaches away from the invention and "[i]t is improper to combine references where the references teach away from their combination." *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). Examiner has improperly taken Applicants' own remarks out of context in supporting the rejection.

For at least the foregoing reasons, Applicants' amendments filed on July 22, 2010 do not encompass new matter.

Regarding the limitation of predetermined variations in the emission properties corresponding to multiple predetermined excitation polarization wavelengths, Examiner stated that "there is no support for the amendment requiring 'predetermined variations in at least one emission property of the population CORRESPONDING TO multiple predetermined excitation polarization angles.'" (OA, pg. 6) Applicants respectfully disagree with this rejection and submit that the specification fully supports the limitation of claim 69 within the meaning of the written description requirement of §112. Support for this limitation is provided at, e.g., paragraph 59 of the specification:

information can be encoded in the incident angle of polarized excitation wavelengths required to excite certain nanocrystal subsets. If a nanocrystal taggant composition consists of nanocrystal spheres, the spheres can absorb the excitation light from any direction, and the emission light can be non-polarized. However, a nanocrystal taggant composition of nanorods can be oriented, e.g., to be excited only by polarized excitation wavelengths incoming at an incident angle parallel to the rods. **In this way subsets of nanorods with common orientation can be excited separately from nanorod**

**subsets with other orientations.** In the case, e.g., of polarization angle oriented nanocrystal rods, **information can be sequentially gathered, e.g., by exciting the taggant composition from a first angle and detecting emissions from a first subset of oriented rods (the emissions typically returning in substantially in the opposite direction), then by exciting the taggant composition from another angle to excite a second subset of oriented rods to detect a second emission spectra. In this way, multiple encoded data sets can be detected from a single taggant composition.**

Regarding the term “predetermined,” Applicants’ specification provides at paragraph 19: **“Predetermined spectra can be provided by varying, e.g., ...a polarization of a nanocrystal.”** It would be clear to a person of ordinary skill in the art upon reading the specification that the invention described in the specification includes a unique spectral code which can be created, e.g., by tuning, and thereby “predetermining,” the excitation polarity angles of different subsets of nanocrystals to encode the nanocrystal population. Since the embodiment of the invention in claim 69 relates to nanocrystal compositions for coding using spectral properties, it is inherent in the description that the tuning is performed in order to establish a predetermined spectral property.

Although Applicants respectfully disagree with Examiner’s arguments regarding claim 69, claim 69 is canceled herein to expedite the application to allowance.

#### Enablement Requirement

Examiner alleged that “the claims are not enabled for authenticating spectral codes wherein the subsets of nanocrystals interact (i.e. cooperatively or in some other manner) with one another.” (OA, pg. 7) Applicants respectfully disagree. The present claims are fully enabled by the specification as filed, as explained below.

1. Regarding the limitations of interaction between optical properties of distinct subsets of nanocrystals within a single mixture, Examiner alleged that “[t]he claims do not recite how this interaction effects [*sic*] the emissions profile.” (OA, pg. 7) As explained above, Examiner has misinterpreted the claims requiring an interaction between nanocrystals of different subsets, whereas claims are directed to the interaction

of **optical properties** of nanocrystals of different subsets. Regardless of Examiner's misinterpretation of the claims, the claims clearly establish the relationship between the interaction and the unique spectral code. The claims include a unique spectral code **comprising** at least one optical property **defined by** the interaction of optical properties of at least two of the two or more different subsets of nanocrystals. Thus, a clear relationship is established between the interaction and the spectral code—i.e., the “at least one optical property...” is a component of the “spectral code.” Examiner further suggested that claim 1 does not recite the “degree of non-linearity resulting from, for instance, a cooperative interaction of two distinct subsets of nanocrystals in a mixture.” (OA, pg. 7) As explained above, the claims refer to the interaction of **optical properties** of nanocrystals, not the interaction of the **nanocrystals** themselves. A person of skill in the art, especially in light of Applicants' specification, would understand the effects of interactive optical properties. For example, in the case of a spectral code comprising an optical property defined by the interaction of emission wavelengths of different nanocrystal subsets, the measured intensity would increase at wavelengths where the emission wavelengths of the nanocrystal subsets interact. (Figures 3A-3B and ¶ 76). Further support for this concept is provided in the specification, e.g., at ¶ 56-58:

At a given emissions wavelength, e.g., 10 or more relative (or absolute) intensities can be detected and resolved...Emissions bandwidth can be shared between two or more nanocrystal subsets by, e.g., providing populations that respond to different excitation wavelengths... Although the emission spectra of the two populations can overlap, they can be detected and unambiguously decoded separately by illuminating the populations first with one excitation wavelength, then with the other excitation wavelength...In another embodiment...By selecting and comparing emitted wavelength or intensities at predetermined angles, e.g., using polarized light filters, the emissions of some subsets can be detected (and interpreted) separately from emissions of other subsets.

2. Examiner further alleged that “the specification does not shed light on how these interactions between distinct subsets of nanocrystals occurs.” (OA, pg. 7) As explained above, Examiner has misinterpreted the claims as requiring an interaction between nanocrystals of different subsets, whereas the claims include the interaction of **optical properties** of nanocrystals of different subsets. Regardless of Examiner's

misinterpretation of the claims, as explained above, the specification fully enables a person of ordinary skill in the art to achieve the methods of the invention.

3. Examiner stated: "In the Remarks of 26 April 2010, applicant confirms the teaching in the last paragraph on page 632 of Han et al. by reiterating that in multiplexed optical coding, there CANNOT be interactions between the nanocrystal subsets (in this instance, the interaction disclosed in Han et al. is fluorescence resonance energy transfer)." (OA, pg. 8) However, as explained above, Applicants' remarks regarding Han were not made to confirm the teachings of Han, but to show that Han teaches away from the invention embodied by Applicants' claims. Further, Applicants maintain the following positions: (1) Han teaches away from the invention of the present claims. (2) Applicants' invention is non-obvious in light of Han since the invention proceeds contrary to the teachings of Han, and "proceeding contrary to accepted wisdom is evidence of nonobviousness." *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986). (3) The invention is not obvious in light of Han since Han teaches away from the invention and "[i]t is improper to combine references where the references teach away from their combination." *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). Examiner has improperly taken Applicants' own remarks out of context in supporting the rejection.

4. Examiner further argued that "one of skill in the art must guess at how the interactions between nanocrystal subsets affect the emissions profiles. Such guessing amounts to UNDUE EXPERIMENTATION." (OA, pg. 8) However, as explained above, a person of ordinary skill in the art would have possessed the requisite knowledge to practice the invention without undue experimentation. For example, a person of ordinary skill in the art would clearly understand the concept of relative and absolute intensity at a given wavelength. Regardless, this concept is illustrated in the specification, e.g., at Figures 3A-3B and ¶ 76.

Indefiniteness

Claim 68 was rejected under §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Examiner specifically addressed the term “invisible to the naked eye. Applicants respectfully disagree with the arguments set forth by Examiner. However, claim 68 is canceled herein to expedite the application to allowance.

III. Rejections Under 35 U.S.C. §102(b)

Claims 67-68 were rejected under 35 U.S.C. §102(b) as being anticipated by Han. The claims are not anticipated by Han, as explained above regarding the rejections under §112. Additionally, claim 67 is amended herein to include the following limitation: “the spectral code comprising a first emission wavelength of a first nanocrystal subset and a second emission wavelength of a second nanocrystal subset, wherein the first and second emission wavelengths are the same.” As explained above, Han teaches away from such limitation. Thus, claim 67 is not anticipated by Han. As explained above, the limitation regarding geometric shapes are removed from the claims, and claim 68 is canceled herein to expedite the application to allowance.

IV. Rejections Under 35 U.S.C. §103(a)

Claim 69 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Han, in view of Chung et al. (PNAS, 21 January 2003, volume 100, pages 405-408) (“Chung”). Applicants respectfully submit that this combination of references relied upon by Examiner cannot support a *prima facie* case of obviousness at least because Han teaches away from such a combination and the proposed combination would change the principle of operation of the primary reference, Han. However, in order to expedite the current application to allowance, claim 69 is canceled herein.



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### **CONCLUSION**

In view of the foregoing, Applicants believe all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the claims are deemed not to be in condition for allowance after consideration of this Response, a telephone interview with the Examiner is hereby requested. Please telephone the undersigned at (650)331-2209 to schedule an interview.

Respectfully submitted,

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